

# Information Technology Essentials

## COMP106



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### **Chapter 10**

## **Network Technologies**

## Objectives

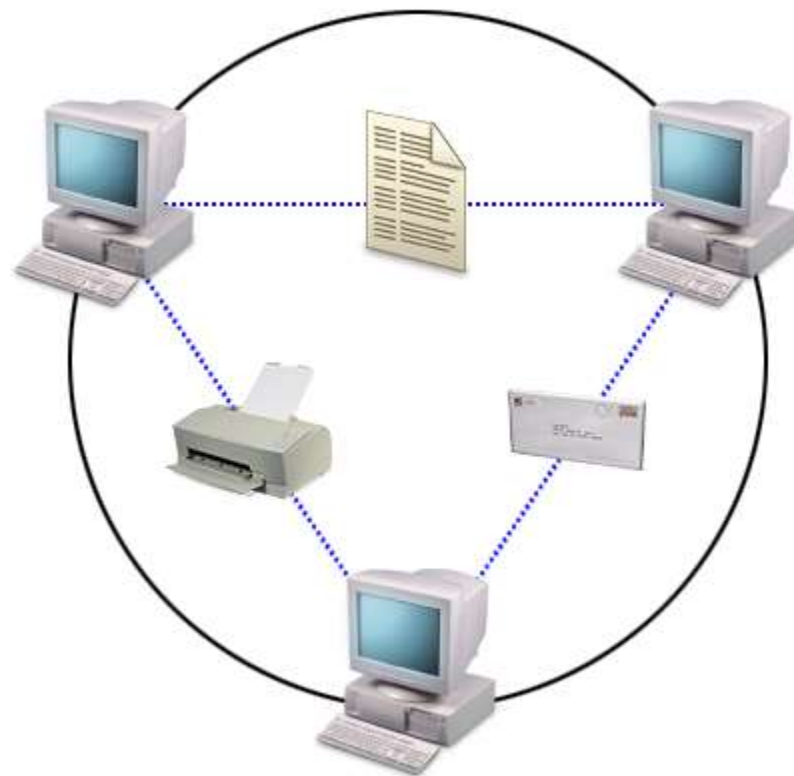
- ◆ In this session, you will learn to:
  - ◆ Identify fundamental concepts of computer networks.
  - ◆ Identify network communications technologies.
  - ◆ Identify network connectivity technologies.
  - ◆ Identify Internet technologies.

## Network concepts

- ◆ For learning networking concepts, you need to understand the following:
  - ◆ Networks
  - ◆ Network models
  - ◆ Network interface card characteristics
  - ◆ Twisted pair cables
  - ◆ RJ-45 twisted pair connectors
  - ◆ Coaxial cables
  - ◆ Coaxial cable and connector types
  - ◆ Fiber optic cables
  - ◆ Fiber optic connectors
  - ◆ Other network connection types

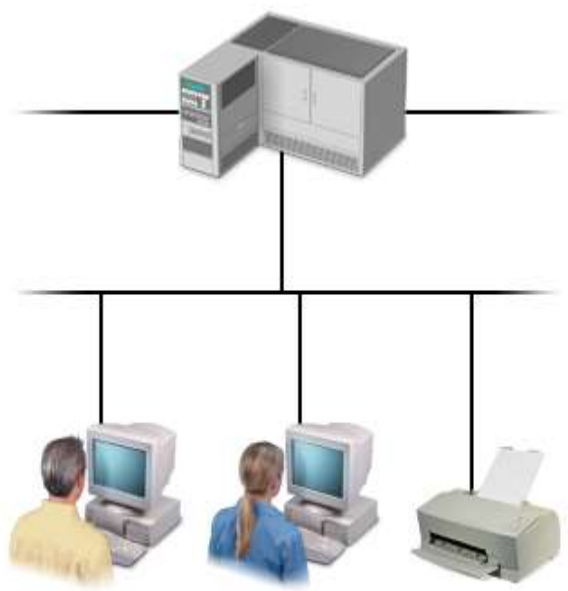
## Networks

- ◆ A network:
  - ◆ Group of computers
  - ◆ Share resources
- ◆ A network includes:
  - ◆ Network media
  - ◆ Network adapter
  - ◆ Network operating system
  - ◆ Network protocol

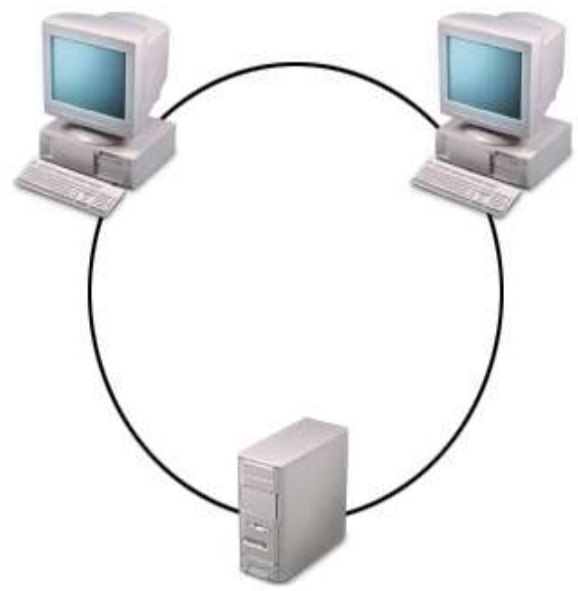


# Network Models

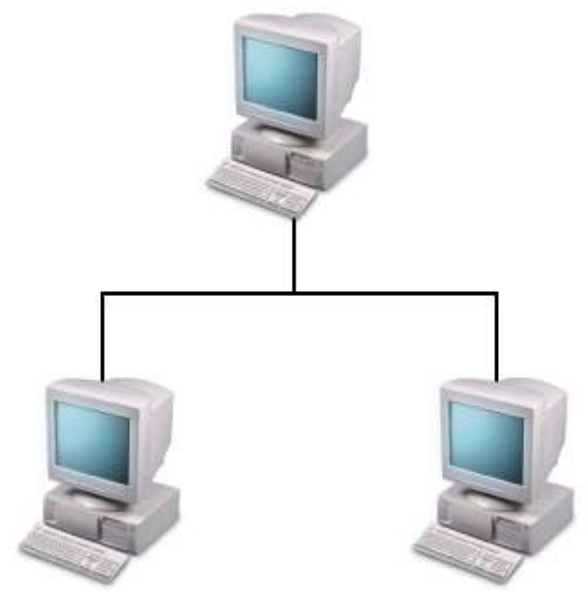
- ◆ Network models:
  - ◆ Centralized
  - ◆ Client-server
  - ◆ Peer-to-peer



Centralized



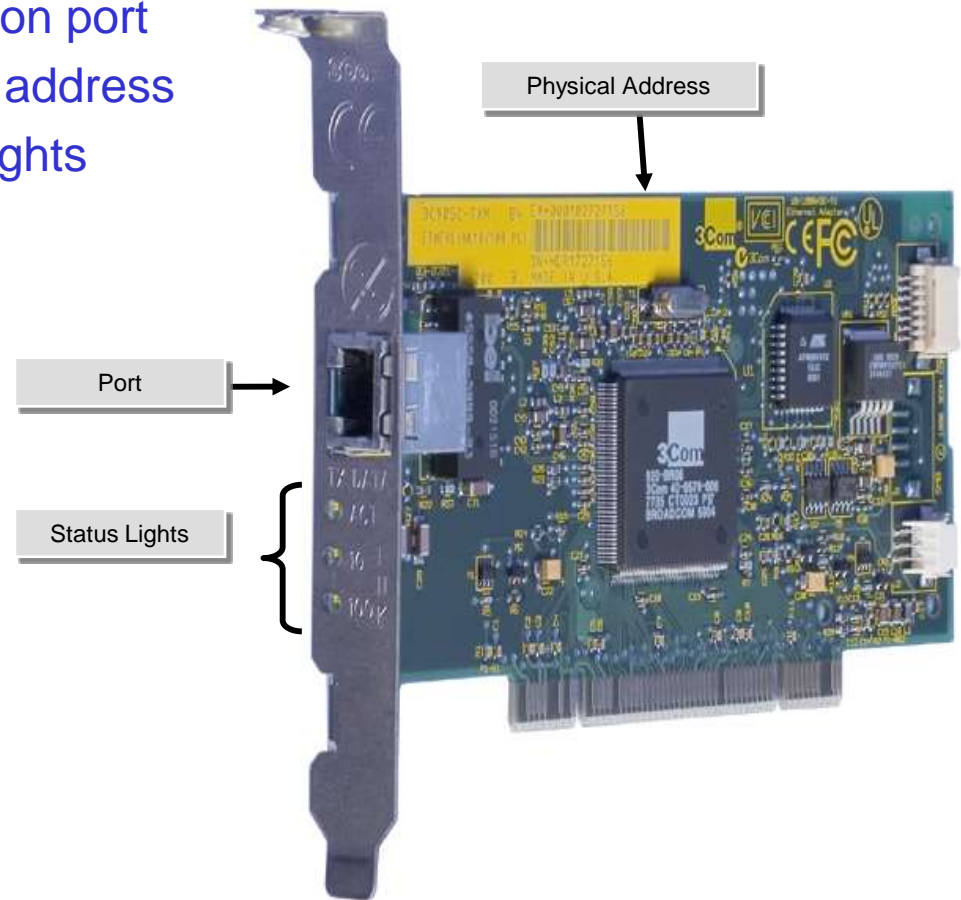
Client-server



Peer-to-peer

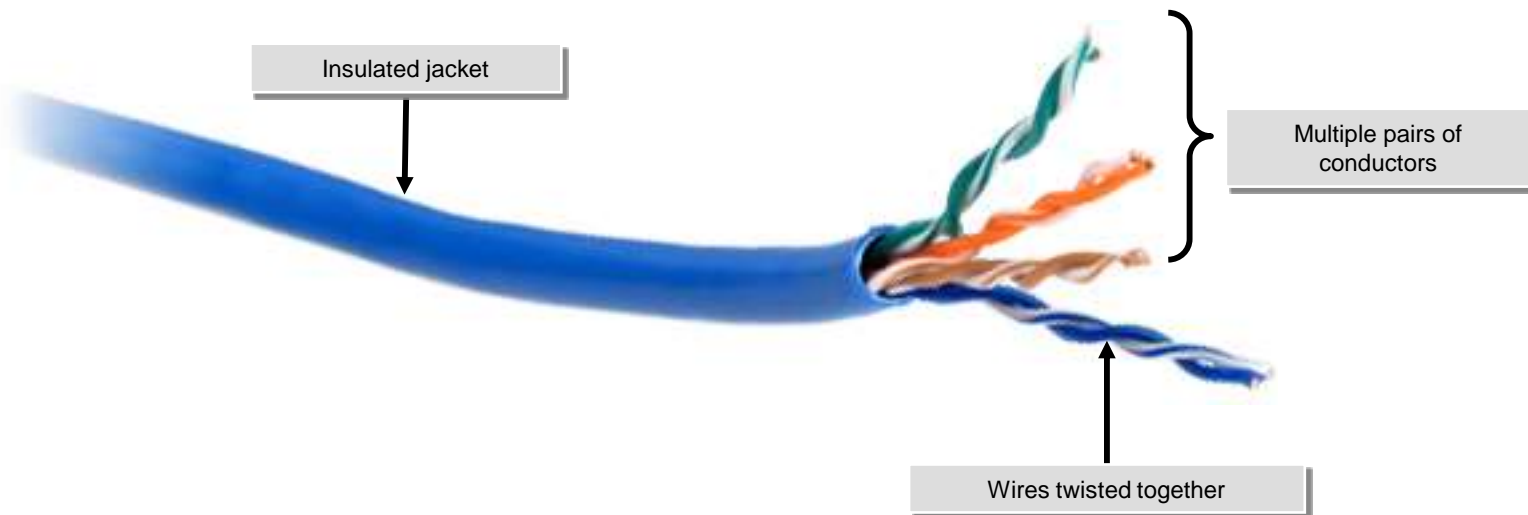
## Network Interface Card Characteristics

- ◆ Network interface card characteristics:
  - ◆ Network connection port
  - ◆ Physical network address
  - ◆ Status indicator lights



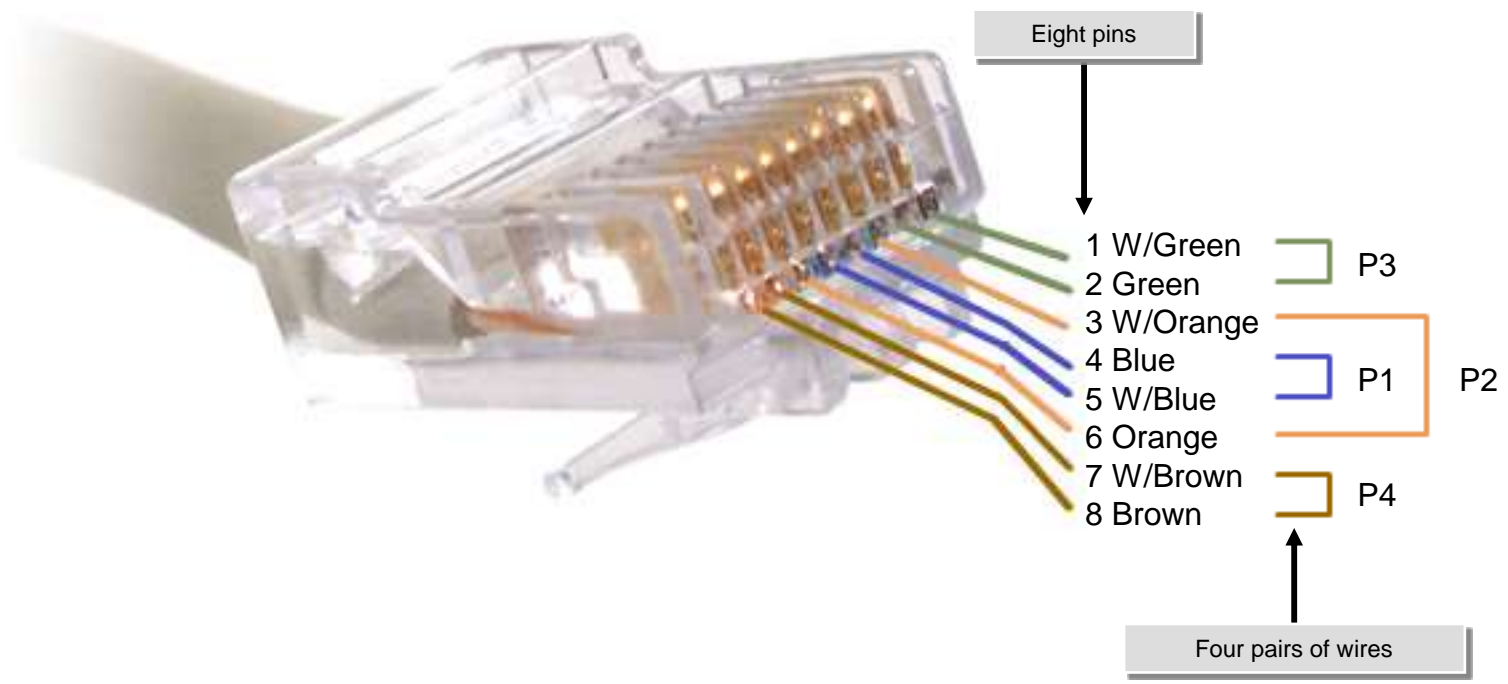
## Twisted Pair Cables

- ◆ The **twisted pair** is a type of cable in which multiple insulated conductors are twisted around each other in pairs and clad in a protective and insulating outer jacket.
- ◆ Types:
  - ◆ Unshielded Twisted Pair (UTP)
  - ◆ Shielded Twisted Pair (STP)



# RJ-45 Twisted Pair Connectors

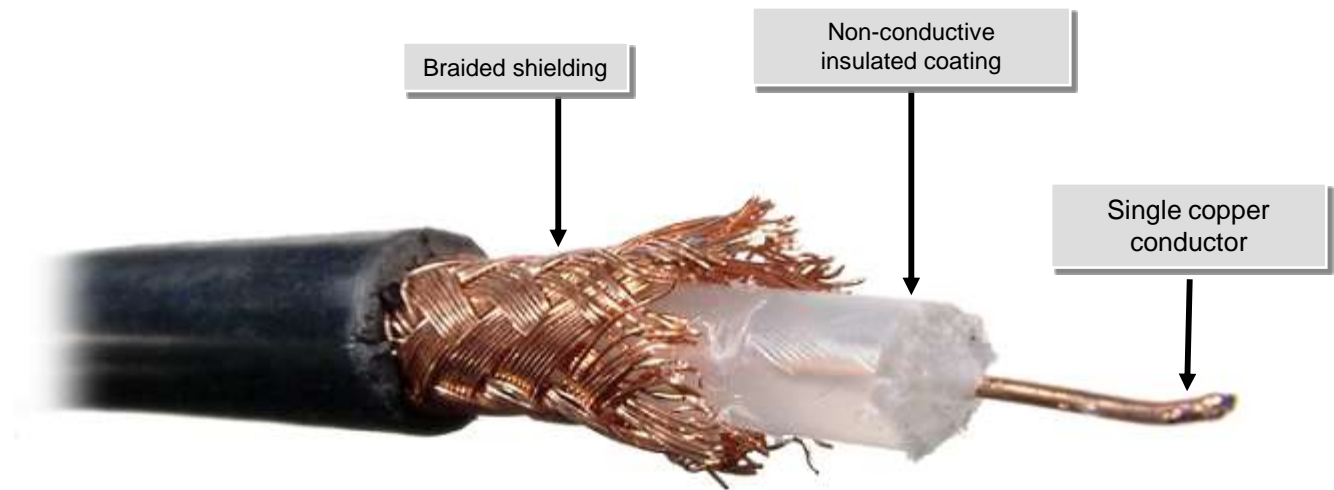
- ◆ The RJ-45 connector is used on twisted pair cable.





## Coaxial Cables

- ◆ The **coaxial cables**, or coax, is a type of copper cable that features a central conductor surrounded by braided or foil shielding.



## Coaxial Cable and Connector Types

- ◆ Coaxial cable type:
  - ◆ 5 mm/0.25 inch (“Thinnet”)
  - ◆ 10 mm/0.5 inch (“Thicknet”)
- ◆ Connector types:
  - ◆ BNC connector
  - ◆ T-connector



BNC connector on thin net cable



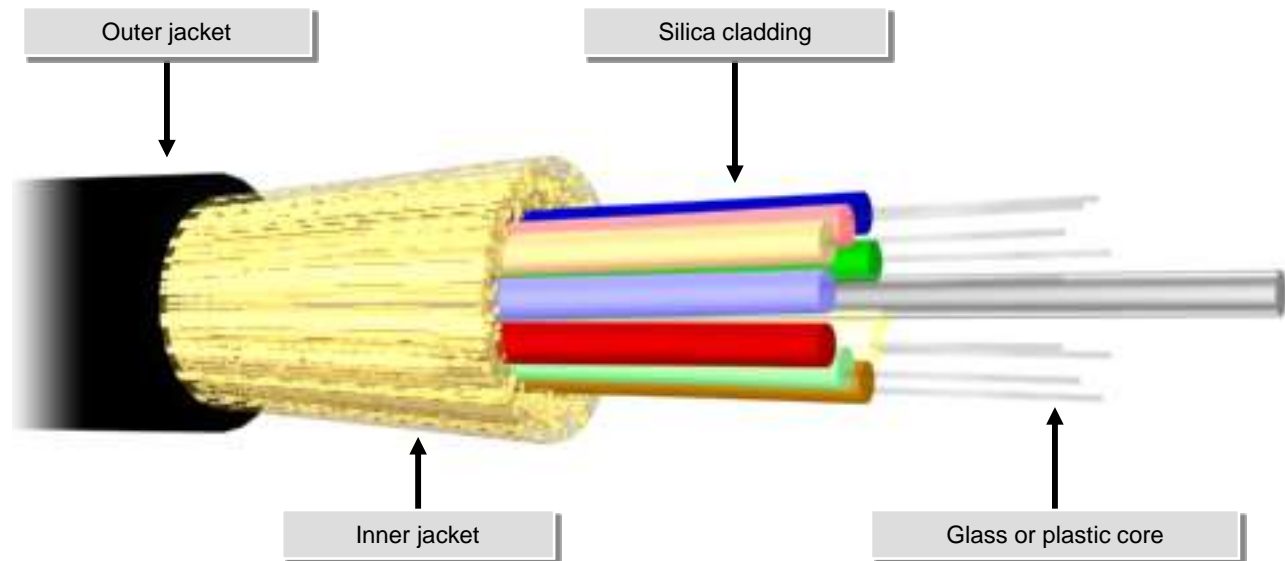
T-connector



50-ohm resistor on T-connector

## Fiber Optic Cables

- ◆ The ***fiber optic cable*** is a type of network cable in which the core is one or more glass or plastic strands.
- ◆ Fiber optic cable mode types:
  - ◆ Single-mode fiber
  - ◆ Step index multimode fiber
  - ◆ Graded index multimode fiber



## Fiber Optic Connectors

◆ Fiber Optic Connectors are:



ST



SC



FC



FDDI



Mini-BNC



Biconic



LC



SMA



MT-RJ

## Other Network Connection Types

### ◆ Other network connection types:

- ◆ USB
- ◆ Firewire
- ◆ RS-232
- ◆ Wireless

USB



Firewire



RS-232



Wireless



## Activity 10-2

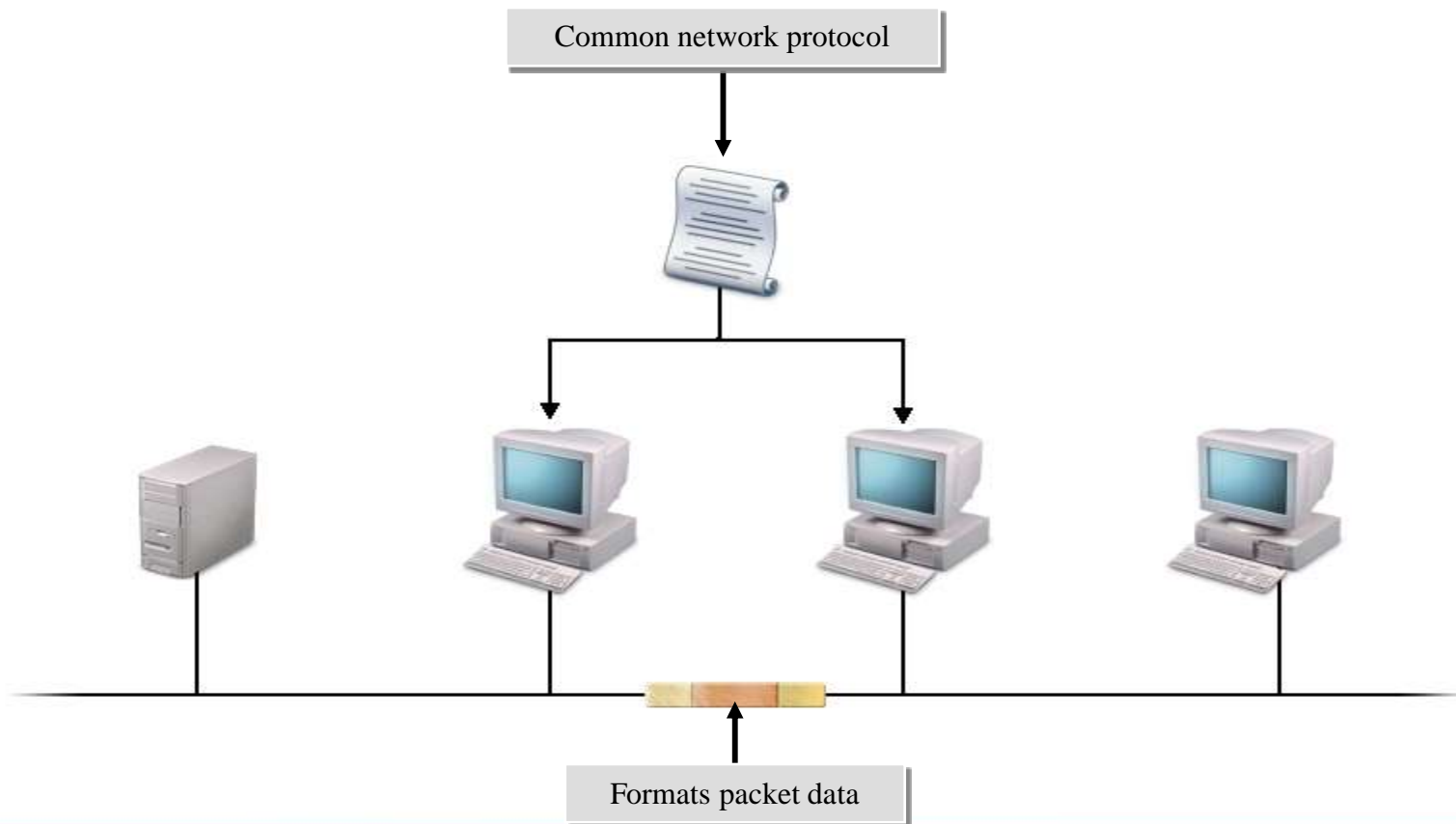
### Activity on Identifying the Local MAC Address

## Network Communications

- ◆ For learning network communication, you need to understand following:
  - ◆ Network protocols
  - ◆ Network addresses
  - ◆ The TCP/IP protocol
  - ◆ IP addresses
  - ◆ Subnet masks
  - ◆ IP address classes
  - ◆ The IPX/SPX and NWLink protocols
  - ◆ NetBIOS
  - ◆ NetBEUI
  - ◆ Network bandwidth
  - ◆ Full and half duplex communications

## Network Protocols

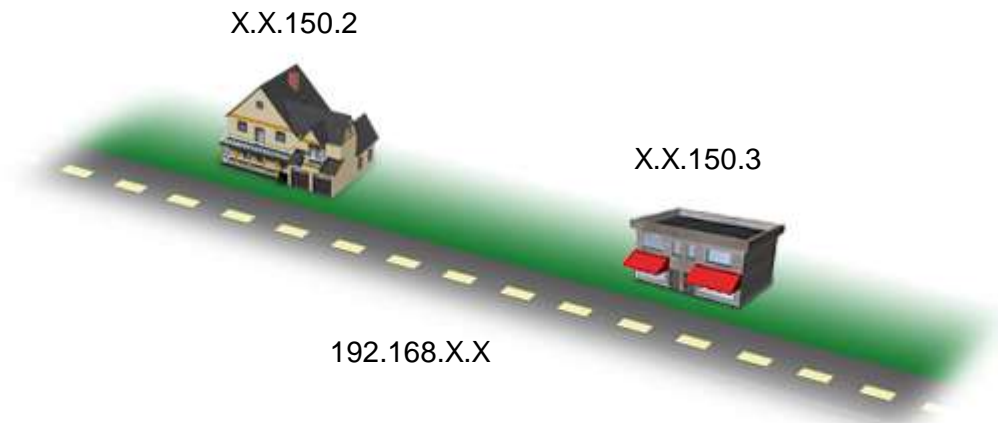
- ◆ A **network protocol** is software that provides the rules to conduct network operations.





## Network Addresses

- ◆ A **network address** is a numeric identification code assigned to a network computer according to network protocol.
- ◆ Network address consists:
  - ◆ Network portion
  - ◆ Node portion



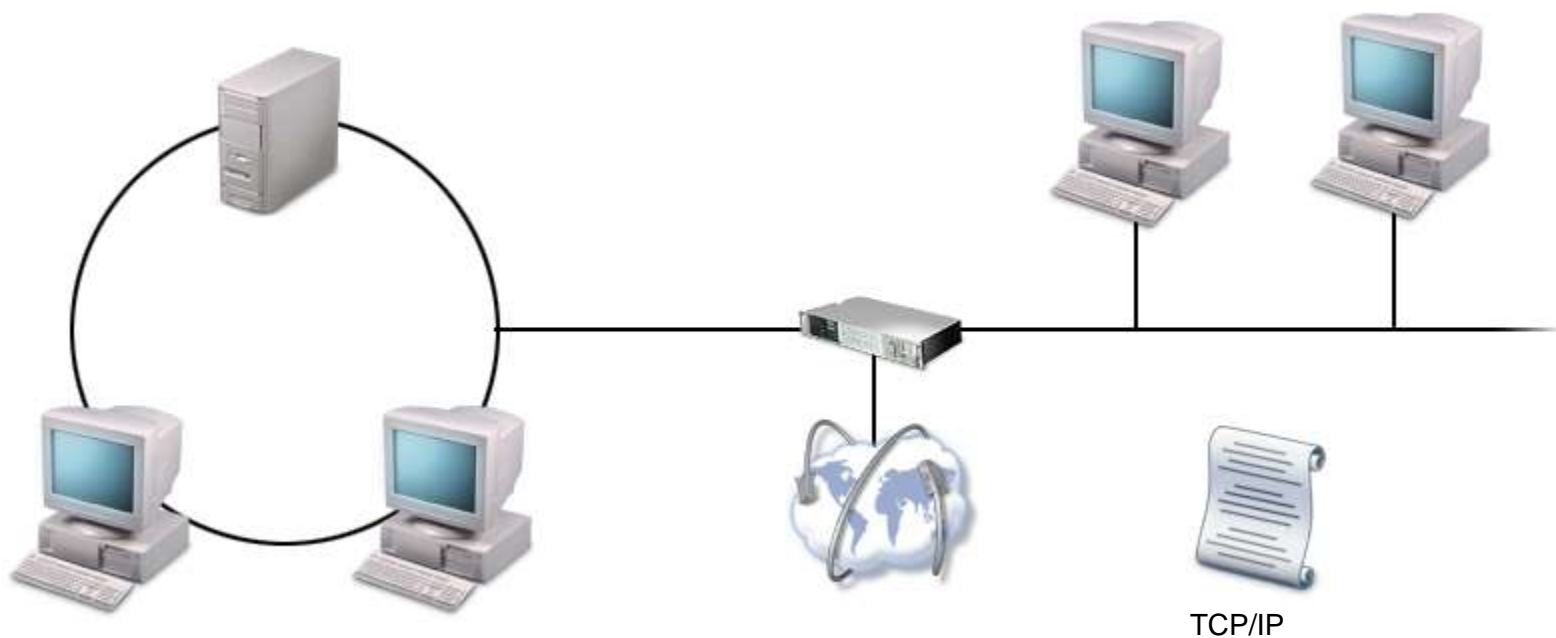
Network portion of address = Street name

Node portion of address = House number

Complete address = Street name and house number

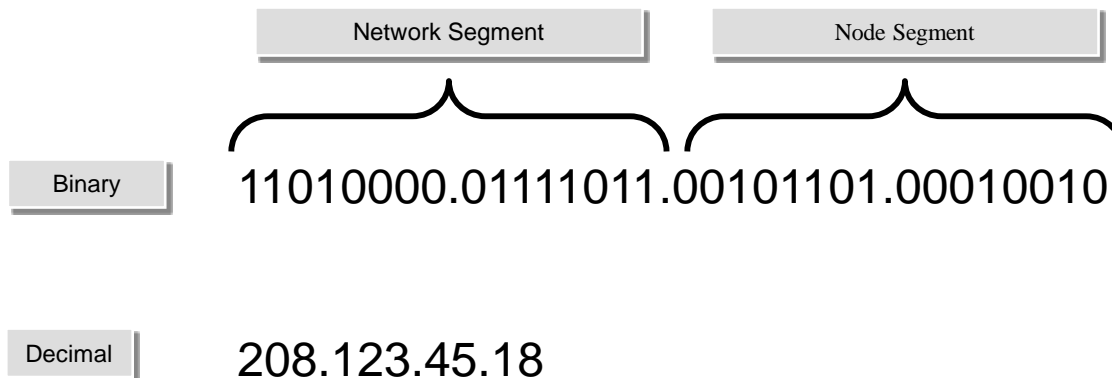
## The TCP/IP Protocol

- ◆ Transmission Control Protocol/Internet Protocol (TCP/IP):
  - ◆ A nonproprietary, routable network protocol
  - ◆ Helps computers to communicate over all types of networks



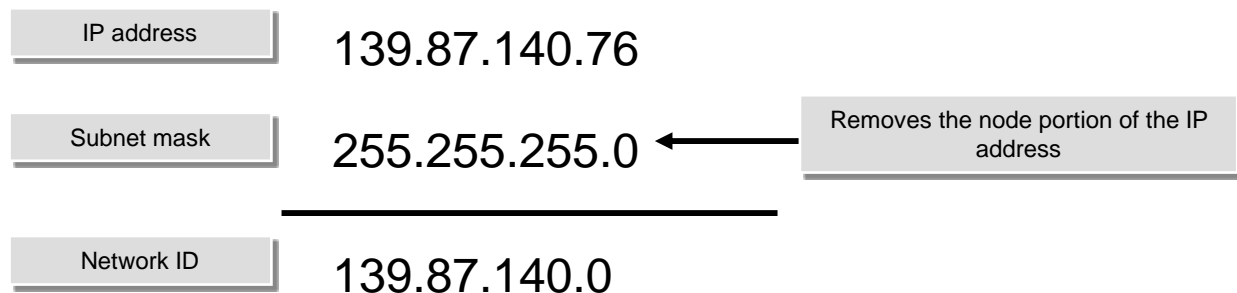
## IP Addresses

- ◆ An **IP address** is a 32-bit binary number assigned to a computer on a TCP/IP network.
- ◆ An IP address consists:
  - ◆ Network segment
  - ◆ Node segment



## Subnet Masks

- ◆ A **subnet mask** is a 32-bit number assigned to each system.
- ◆ Subnet mask divide the 32-bit binary IP address into: and node portions.
  - ◆ Network portion
  - ◆ Node portion



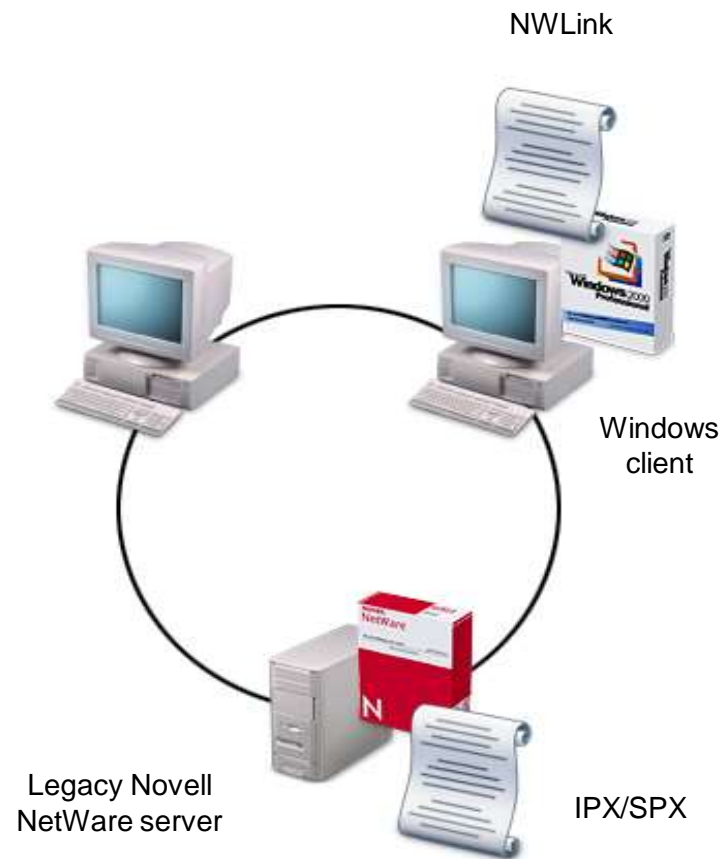
## IP Address Classes

### ◆ The IP address classes:

Address Class	Range	Default Subnet Mask	Networks/Nodes
Class A	1.0.0.0 to 127.255.255.255	255.0.0.0	126 networks of up to 16,777,214 nodes each
Class B	128.0.0.0 to 191.255.255.255	255.255.0.0	16,382 networks of up to 65,534 nodes each
Class C	192.0.0.0 to 223.255.255.255	255.255.255.0	2,097,150 networks of up to 254 nodes each
Class D	224.0.0.0 to 239.255.255.255	None	All members of the multicast session share the same IP address
Class E	240.0.0.0 to 255.255.255.255	None	Strictly for research and experimentation purposes

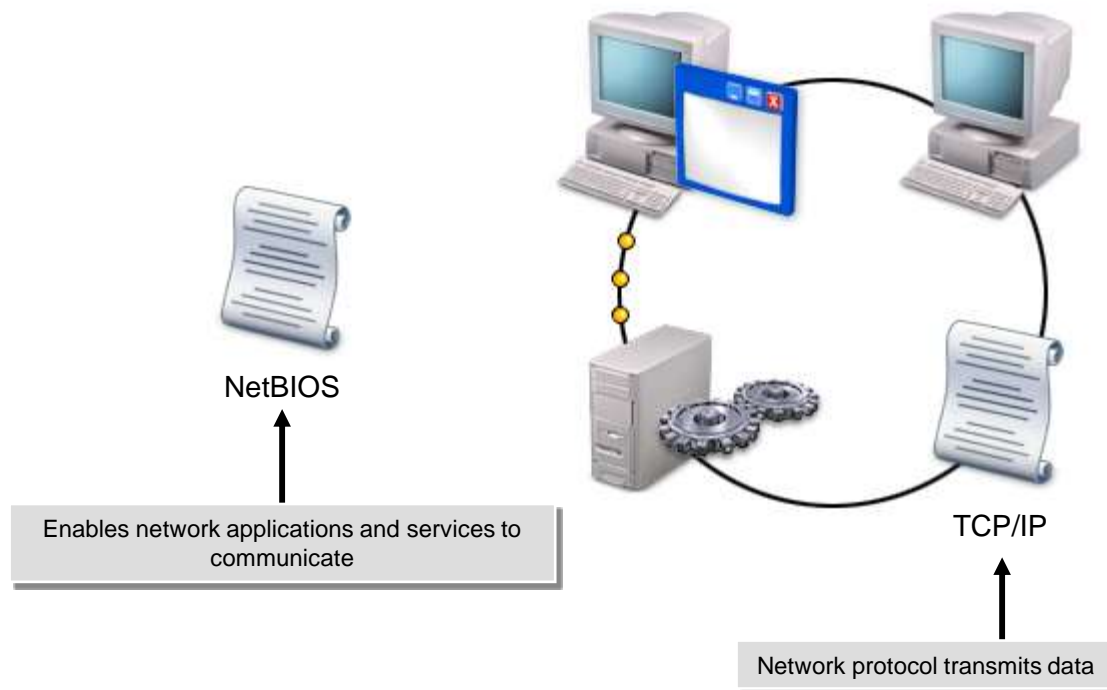
## The IPX/SPX and NWLink Protocols

- ◆ Internetwork Packet Exchange/Sequenced Packet Exchange (IPX/SPX) is a proprietary, routable network protocol suite.



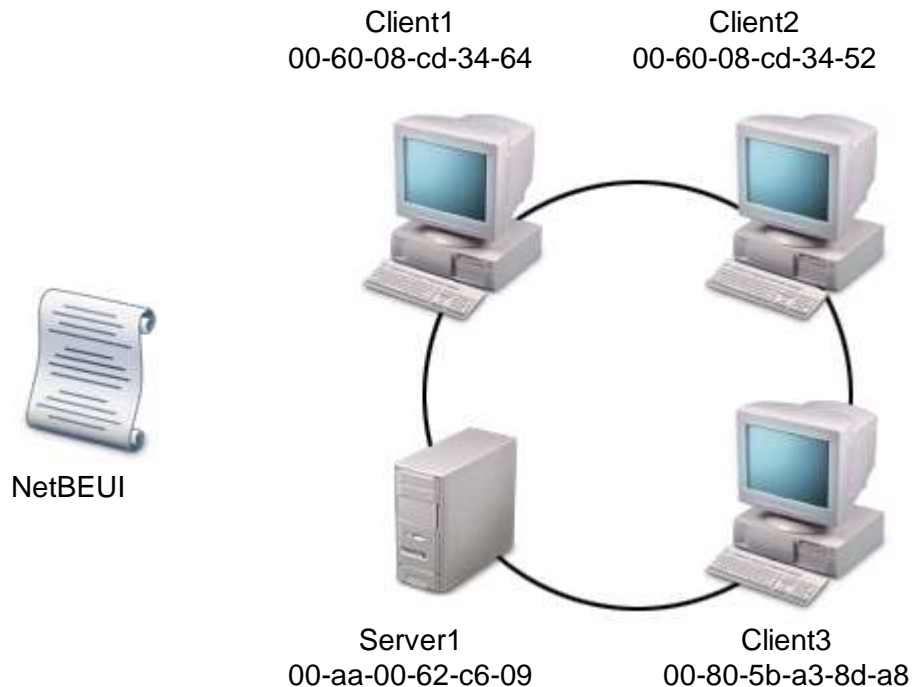
## NetBIOS

- ◆ Network Basic Input/Output System (NetBIOS) a specification enables applications and services to use different network protocols for network communicate.



## NetBEUI

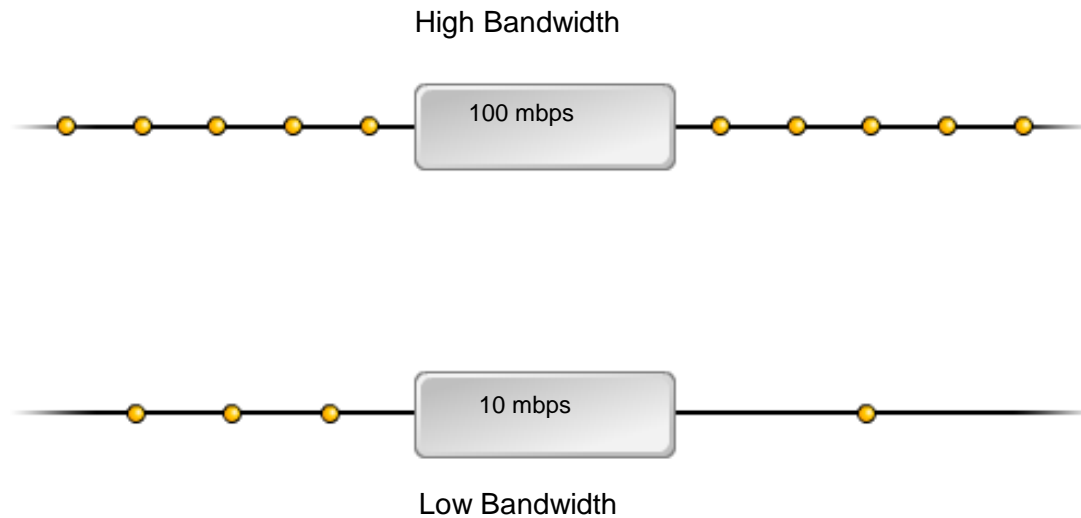
- ◆ NetBIOS Extended User Interface (NetBEUI) is a legacy protocol found only in Windows Networks.





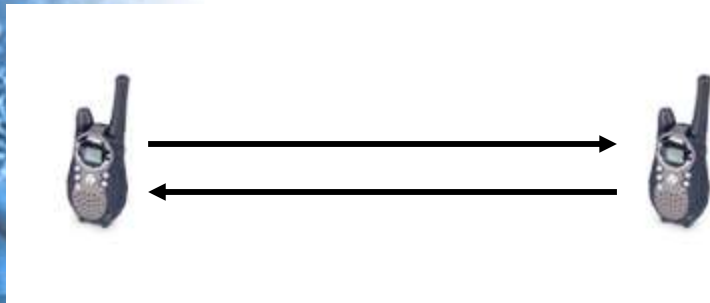
## Network Bandwidth

- ◆ The *bandwidth* helps measure how much data a network can carry.



## Full and Half Duplex Communications

- ◆ The **full duplex** mode communications permit simultaneous two-way communications.
- ◆ The **half duplex** mode communications permit two-way communications, but in only one direction at a time.



Half duplex  
One direction at a time



Full duplex  
Both directions simultaneously

## Activity 10-4

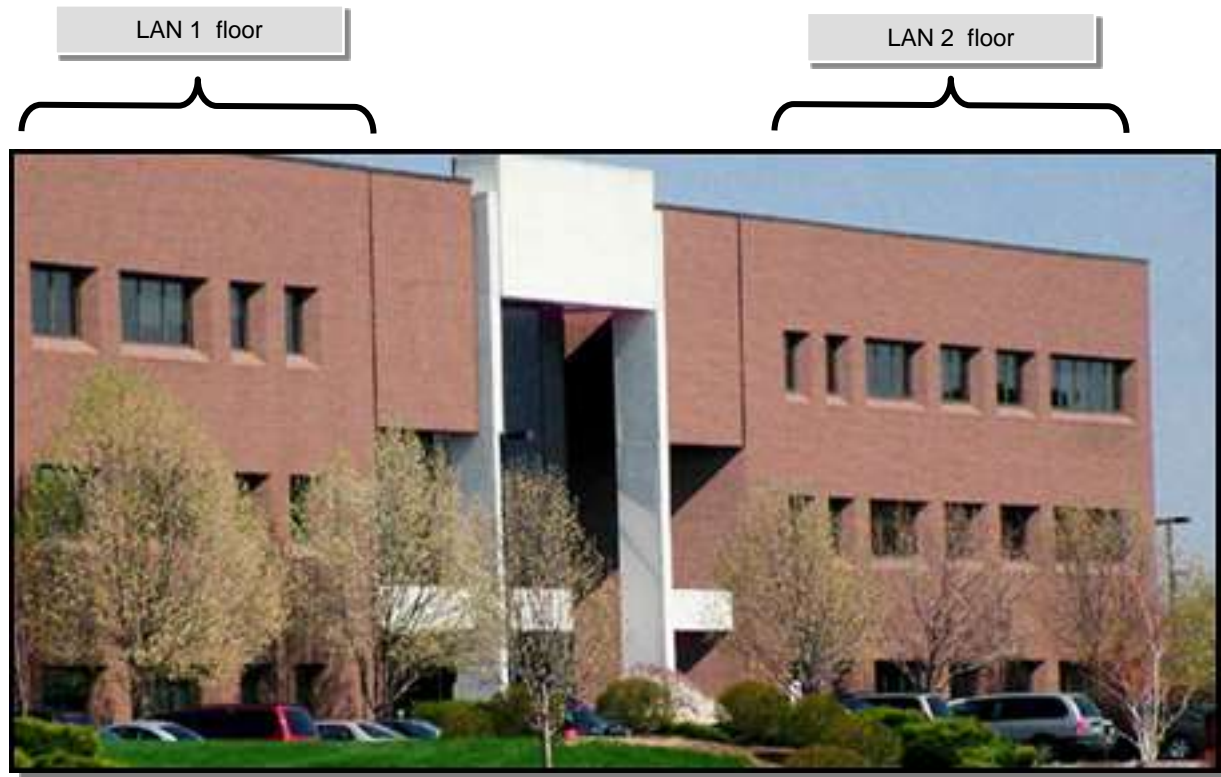
### Activity on Identifying Local Network Characteristics

## Network Connectivity

- ◆ For learning networking connectivity, you need to understand the following:
  - ◆ Local Area Networks (LANs)
  - ◆ Wide Area Networks (WANs)
  - ◆ Ethernet
  - ◆ Dial-up Connections
  - ◆ Wireless Connections
  - ◆ 802.11 Wireless Standards
  - ◆ Wireless Access Points (WAPs)
  - ◆ Bluetooth Communications
  - ◆ Infrared Connections
  - ◆ Cellular WAN Communications
  - ◆ Broadband Communications
  - ◆ Types of Broadband Communications

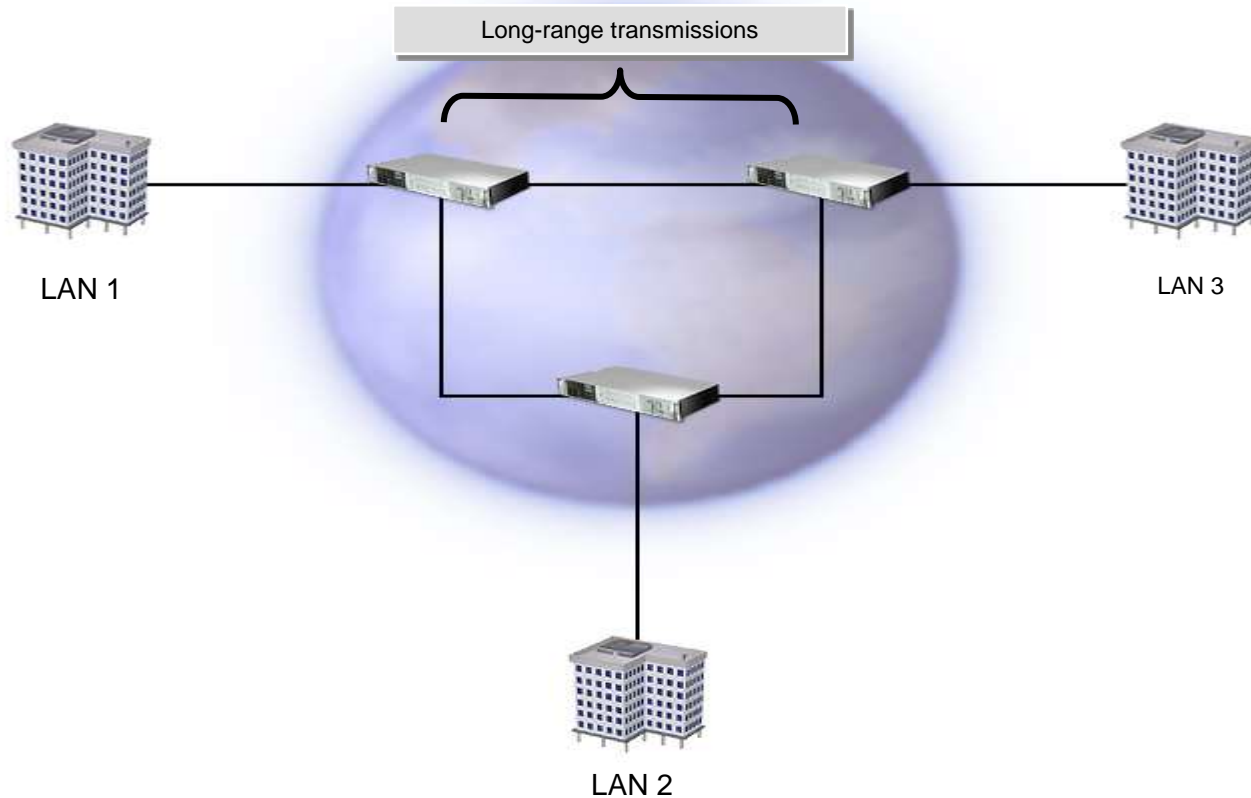
## Local Area Networks (LANs)

- ◆ A **LAN** is a network that spans a small area, such as a single building, floor, or room.



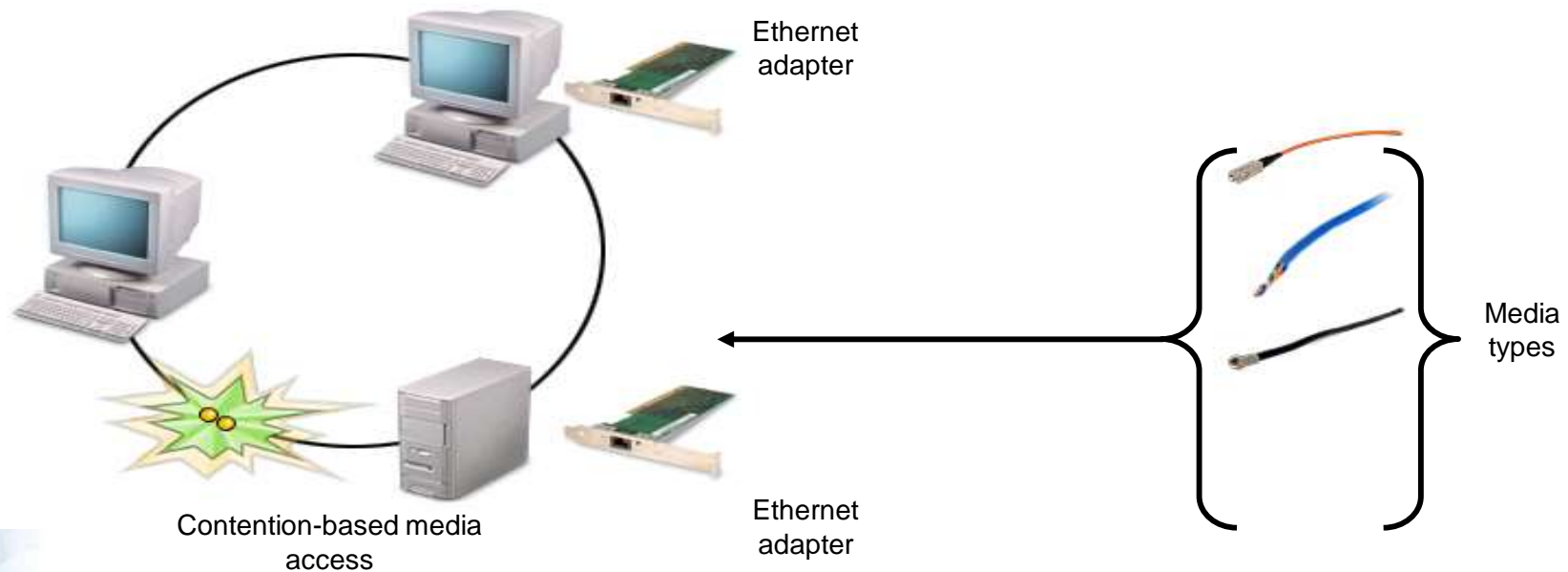
## Wide Area Networks (WANs)

- ◆ A **WAN** is a network that spans multiple geographic locations.



# Ethernet

- ◆ An **Ethernet** network is a popular LAN implementation.
- ◆ Ethernet network consists of:
  - ◆ Adapters
  - ◆ Contention-based media access
  - ◆ Twisted pair, coax, or fiber media



## Dial-up Connections

- ◆ The *dial-up connections* are network connections that use telecommunications media.





## Wireless Connections

- ◆ The *wireless connections* transmit signals without using physical network media.



Infrared



Satellite



Radio

## 802.11 Wireless Standards

- ◆ The 802.11 standard is a family of specifications for wireless LAN technology.
- ◆ 802.11 – IEEE working group
- ◆ Important standards within the group:
  - ◆ 802.11
  - ◆ 802.11a
  - ◆ 802.11b (“Wi-Fi”)
  - ◆ 802.11e
  - ◆ 802.11g

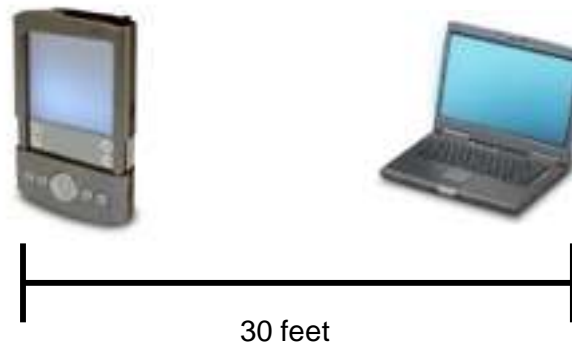
## Wireless Access Points (WAPs)

- ◆ A **Wireless Access Point** (WAP) a device:
  - ◆ Provides connection between wireless devices
  - ◆ Enables wireless networks to connect to wired networks



## Bluetooth Communications

- ◆ Bluetooth is a wireless radio protocol.



## Infrared Connections

- ◆ Infrared is a form of wireless connection in which signals are sent via pulses of infrared light.



Infrared receiver



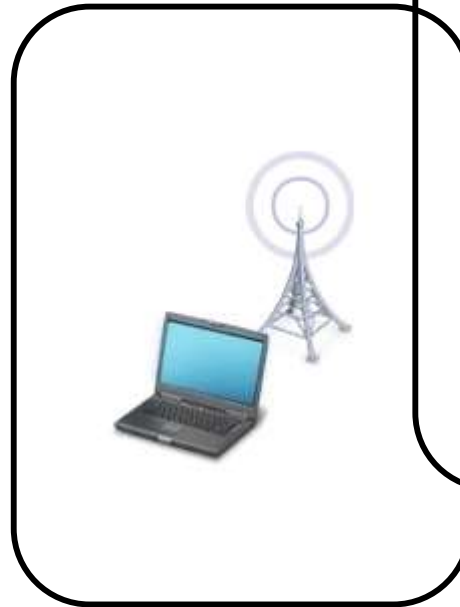
Infrared mouse

## Cellular WAN Communications

- ◆ A cellular WAN technology uses cellular radio signals to transmit data over the cellular telephone system.



Cell



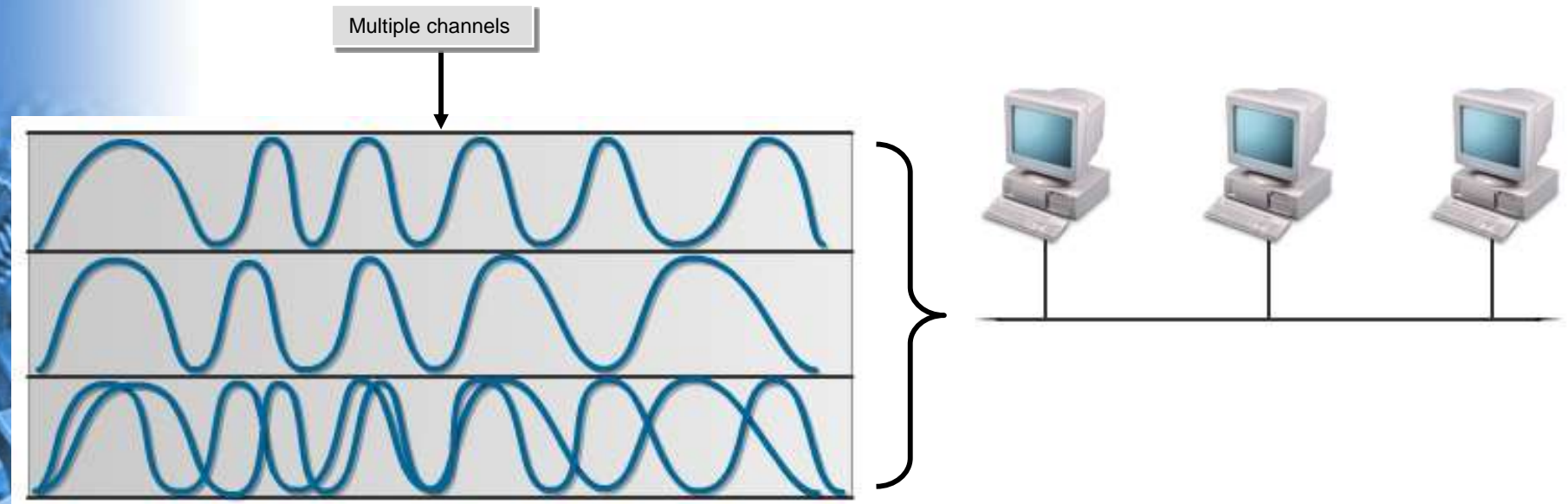
Cell



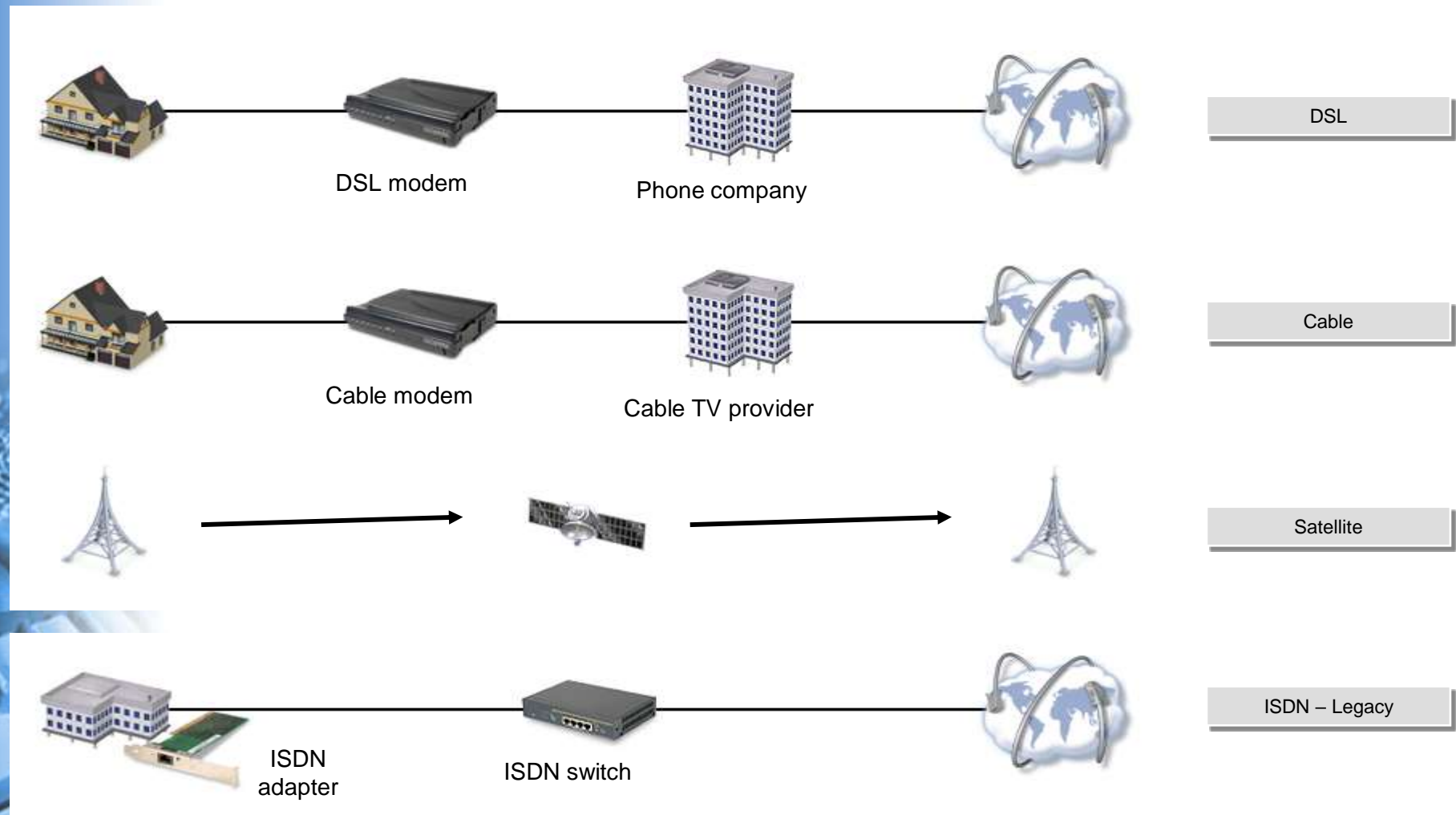
Cell

## Broadband Communications

- ◆ Broadband is a category of network transmission technologies.



# Types of Broadband Communications



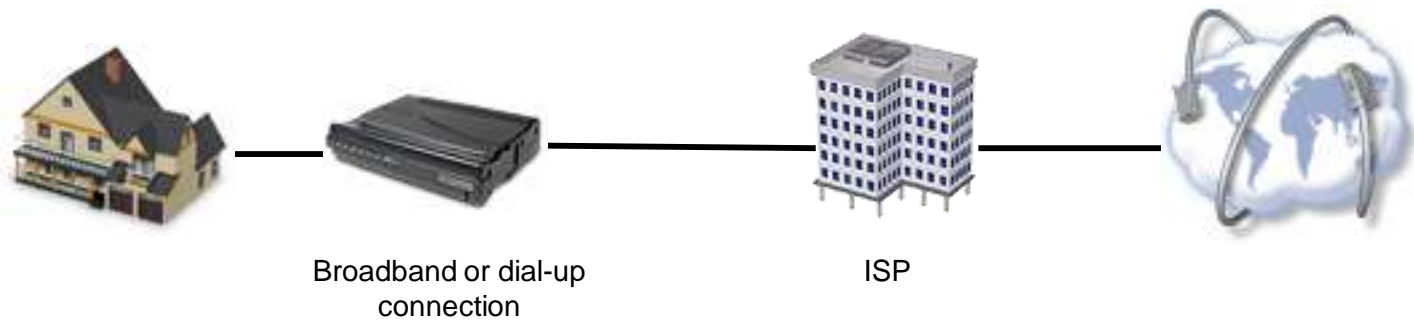


## Internet Technologies

- ◆ For learning internet technologies, you need to understand the following:
  - ◆ Internet Service Providers (ISPs)
  - ◆ SMTP
  - ◆ POP3
  - ◆ IMAP4
  - ◆ HTML
  - ◆ HTTP
  - ◆ SSL
  - ◆ HTTPS
  - ◆ Telnet
  - ◆ FTP
  - ◆ Voice Over IP (VoIP)

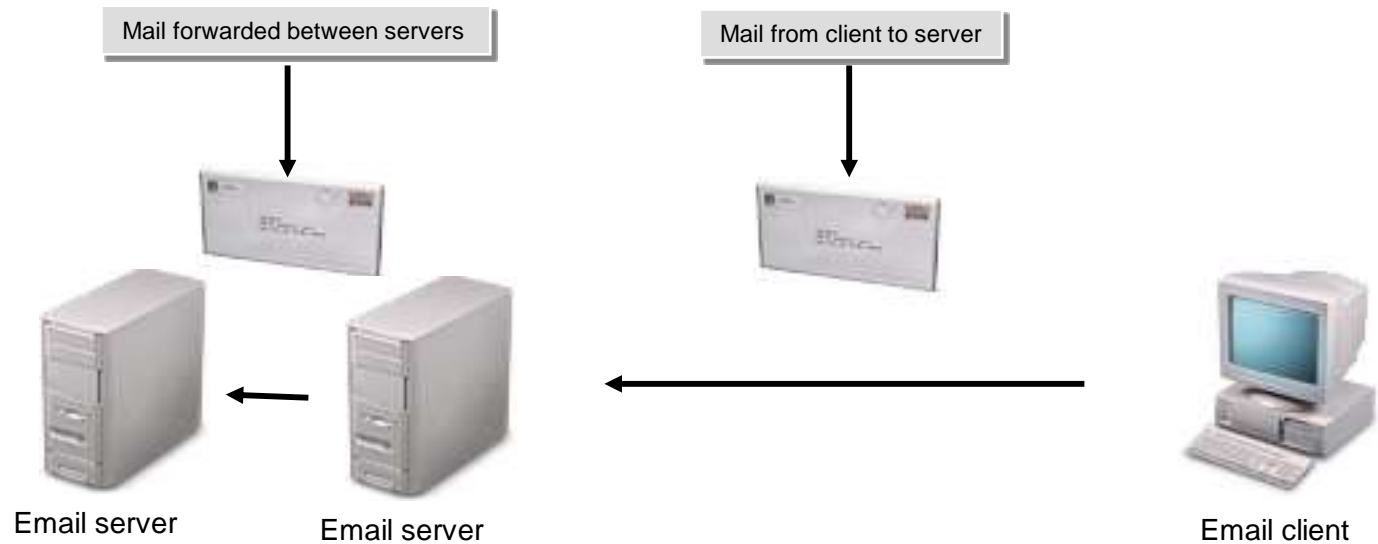
## Internet Service Providers (ISPs)

- ◆ An *Internet Service Provider* (ISP) is a company that provides Internet access.



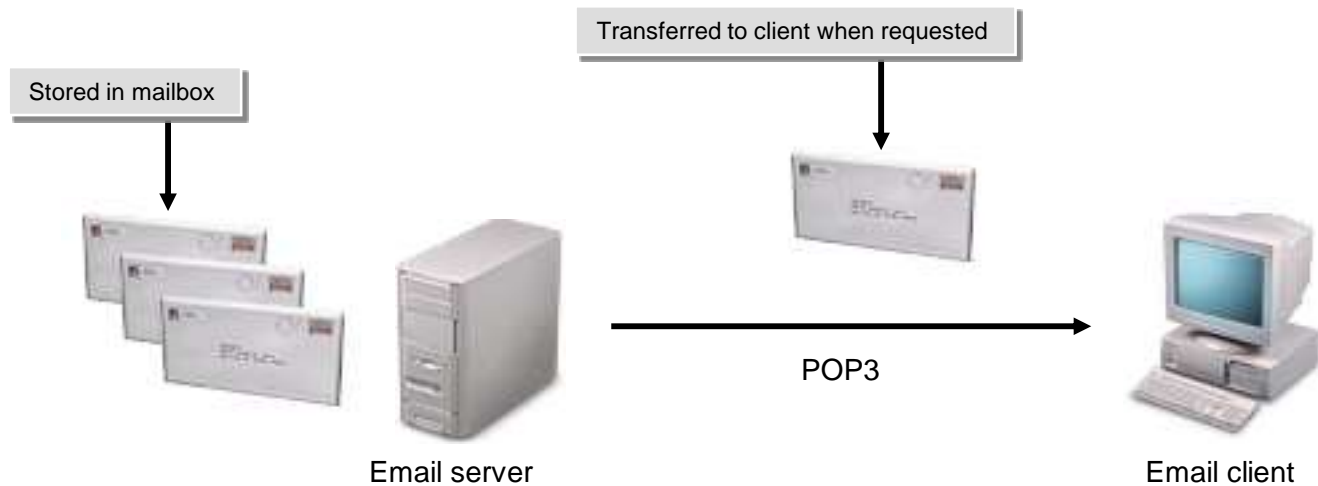
## SMTP

- ◆ Simple Mail Transfer Protocol (SMTP) sends email
  - ◆ Client to server
  - ◆ Between server



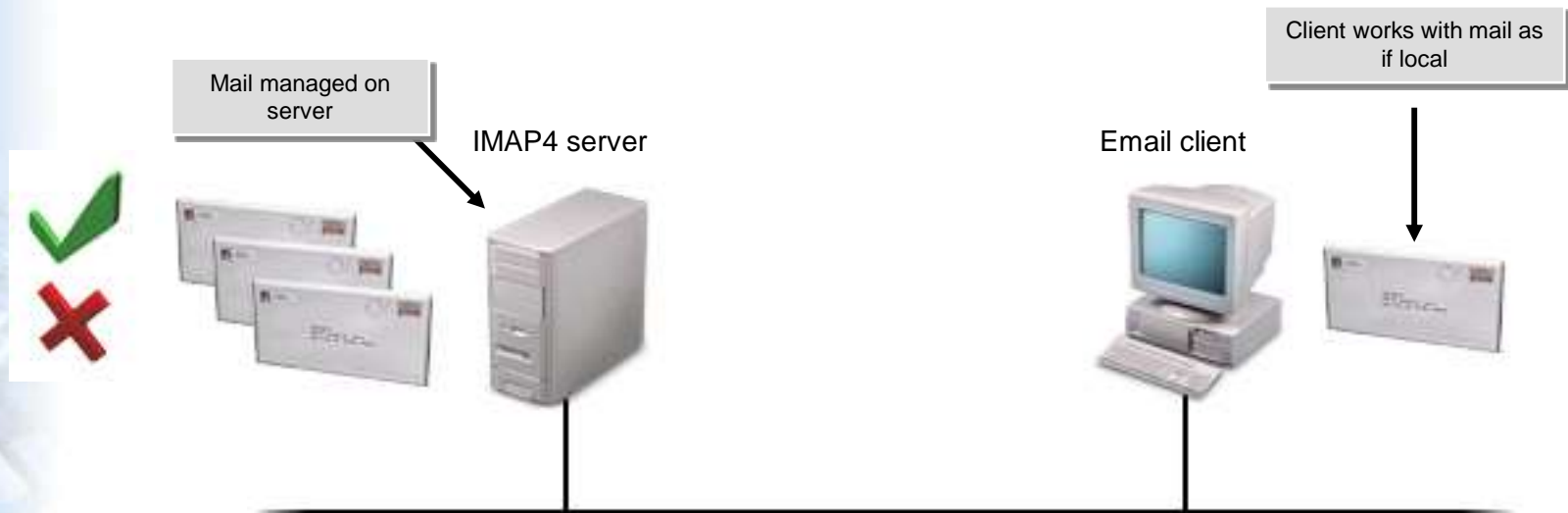
## POP3

- ◆ Post Office Protocol version 3 (POP3):
  - ◆ Helps email client to retrieve email from mail server



## IMAP4

- ◆ Internet Mail Access Protocol version 4 (IMAP4):
  - ◆ Helps web browser to retrieve messages from a mail server



# HTML

- ◆ Hyper Text Markup Language (HTML) is the language to create web based documents.

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN">
<html>
  <head>
    <title>Simple HTML Page</title>
    <meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1">
  </head>
  <body>
    <p>
      This is the text of the web page.
    </p>
  </body>
</html>
```

Page  
structure

Page content

# HTTP

- ◆ Hypertext Transfer Protocol (HTTP):
  - ◆ TCP/IP service
  - ◆ Helps clients to connect and interact with websites



Web client

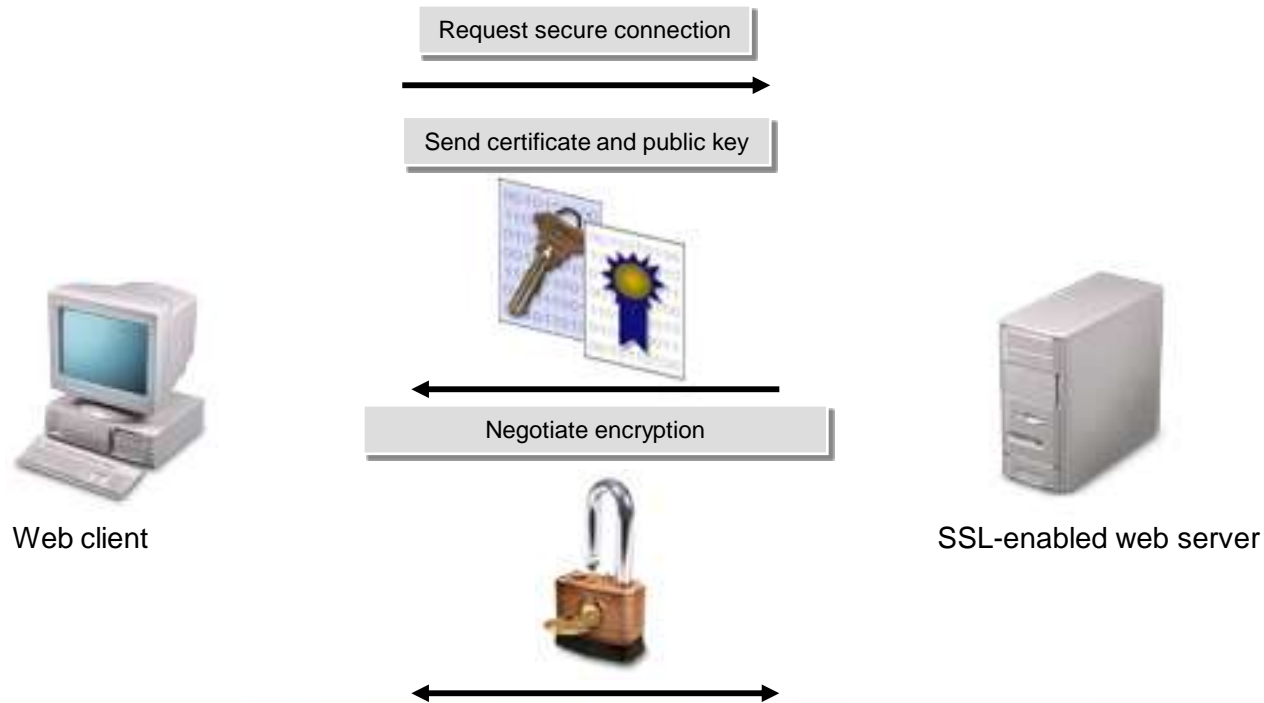
Web server



# SSL

## ◆ Secure Sockets Layer (SSL):

- ◆ A security protocol
- ◆ Combines digital certificates with public-key data encryption for authentication





# HTTPS

- ◆ Hypertext Transfer Protocol Secure (HTTPS) is a secure version of HTTP



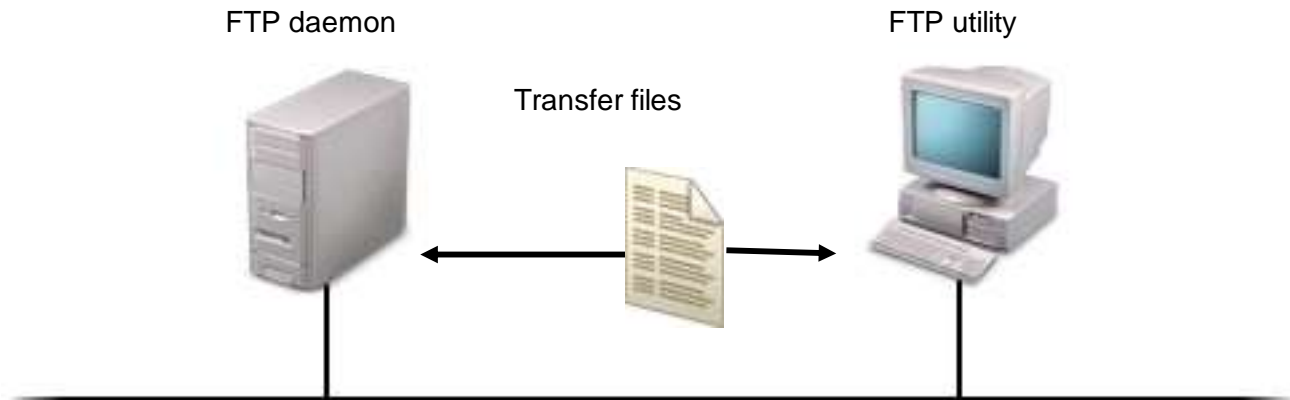
## Telnet

- ◆ Telnet:
  - ◆ A terminal emulation protocol
  - ◆ Helps user to simulate a session on a remote host



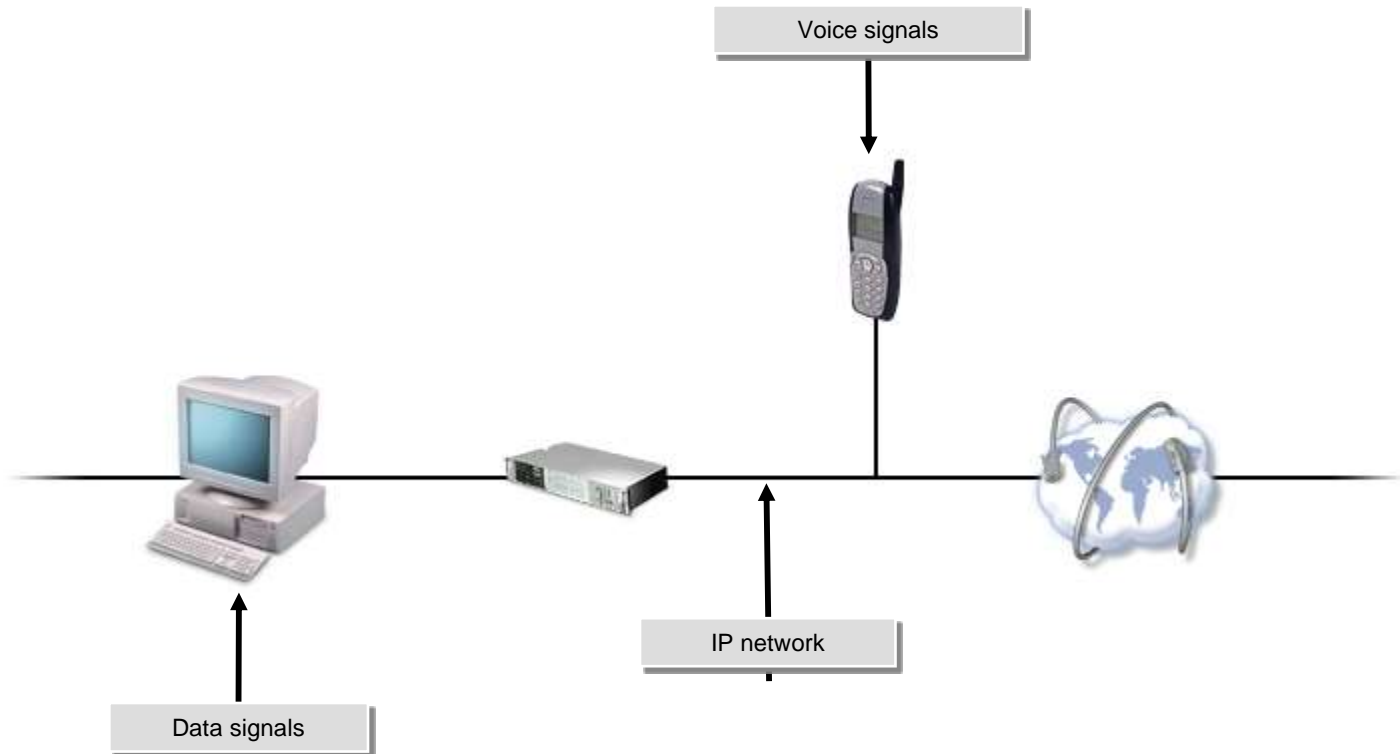
## FTP

- ◆ File Transfer Protocol (FTP):
  - ◆ Helps upload or download files from an FTP file server



## Voice Over IP (VoIP)

- ◆ Voice over IP (VoIP) is a transmission medium in which voice signals are transmitted over IP data networks.



## Summary

- ◆ In this session, you learned that:
  - ◆ There are various network related concepts, such as network models and network connection types.
  - ◆ Network connections uses different kind of cables and connectors.
  - ◆ Network uses network protocols and address for setting up communication between computers.
  - ◆ Network connectivity processes uses LAN and WAN concepts.
  - ◆ ISPs provides internet technology related supports.